DOCUMENT RESUME

ED 370 048 CG 025 446

AUTHOR York, C. Michael; Tross, Stuart A.
TITLE Evaluation of Student Retention Programs: An Essential Component.
PUB DATE Mar 94
NOTE 18p.; Paper presented at the Annual SUCCEED Conference on Improvement of Engineering Education (1st, Raleigh, NC, March 3-4, 1994).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS College Students; *Dropout Prevention; *Evaluation Criteria; Higher Education; Minority Groups; *Program Effectiveness; *School Holding Power
IDENTIFIERS Georgia Institute of Technology; Program Monitoring

ABSTRACT

Student retention continues to be an important concern among college and university officials; many programs have been implemented at postsecondary institutions to improve student retention, especially that of minority students. This paper examines the theory and practice of program evaluation in retention-focused programs. Program evaluations typically assess four different criteria for program participants: (1) reaction; (2) learning; (3) behavior changes; and (4) results. Such evaluations try to determine a program's worth, but a program's effectiveness can be difficult to validate. Even if a positive outcome is realized, there is no way of establishing which of the interventions actually resulted in the improved retention. A quasi-experimental approach is recommended for assessing retention programs where participants are not randomly selected, but do undergo pretest and posttest observations and are compared to control groups. An example is presented of such an evaluation by evaluating a 5-week summer bridge program designed to help minority students adjust to college life. The survey, which was developed in six stages, did show that the program helped students prepare for and adjust to college, but the survey did not document the program as an effective retention intervention. A number of ongoing evaluations are recommended for measuring retention effectiveness. (RJM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 370 048

Evaluation of Student Retention Programs: An Essential Component

C. Michael York

Stuart A. Tross

Georgia Institute of Technology

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

C M YORK

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Paper presented at the First Annual SUCCEED Conference on Improvement of Engineering Education. Raleigh, NC. March 3-4, 1994.

Appreciation is expressed to Suzanne Bollar, Christine Schoob, and Pamela Taylor, who provided helpful editorial assistance and advice for this paper.

We thank numerous undergraduates at the Georgia Institute of Technology for their interview and survey responses which provided insight into the retention problem.

Contact information: C. Michael York, Georgia Institute of Technology, Atlanta, GA 30332-0170. TEL: 404/894-2680; FAX: 404/894-8905.

CG025446

Summary

The retention of students is an important and growing concern among college and university officials. To address this concern, numerous programs have been implemented which aim to improve the retention of students, especially minority students, at our institutions of higher learning. The main purpose of this paper is to discuss one critical component of retention program design and implementation --program evaluation. Evaluation is critical in order to answer the question of whether the program was effective. Toward this end, we discuss the rationale for evaluation, including types of criteria that are typically used, and methodological issues of importance, including the threats to establishing whether a program was actually effective. As an illustrative example, an evaluation of a bridge program undertaken at the Georgia Institute of Technology is discussed. A challenge is issued to those involved in retention program efforts to include the critical component of program evaluation in current and future student retention endeavors.

Introduction

The decision-makers of post-secondary institutions, facing restrictions on financial resources, a decline in the traditional-age freshman pool, and changes in the enrolled undergraduate composition, have renewed their emphasis on retaining the alarming number of potential dropouts. From at-risk identification procedures to planned support innovations, university administrators yearn for more productive and satisfying educational experiences among students aspiring to earn the bachelor's degree.

Background on the Retention Emphasis

During the 1960's, numerous writings about the college retention problem became evident. Presidents Kennedy and Johnson frequently spoke of the changing role of higher education in the pursuit of social improvement. Research and demonstration funding became available for institutional research on student behaviors as seminal legislation was passed by Congress. Financial aid was bolstered; enrollment was enhanced. The Brookings Institute, for example, sponsored a thorough review of personality factors in college success (Lavin, 1965), resulting in designated characteristics of the "high achiever." The American Council of Education launched studies to identify the most promising predictors of academic progress and degree realization (Astin & Panos, 1969). Models of attrition gained prominence in the 1970's (e.g., Tinto, 1975).

Almost three decades after The Higher Education Act of 1965, we are experiencing renewed calls for widespread reform of undergraduate education. Boyer's book entitled *College* (1987), sponsored by The Carnegie Foundation for the Advancement of Teaching, is one example. Earlier, a 1984 National Institute of Education report focused on the provision of more student-oriented resources in the first year of campus life (i.e., emphasis on "front-loading" to promote intense intellectual interaction between students and instructors).

Rationale for Evaluation

Without some kind of systematic evaluation we will not know if the program objective was accomplished. We live in an era of accountability, making evaluative information vitally important to program staff and sponsors. In most instances, we are expected to "prove" that what we do is valuable. Toward that end, evaluation planning and implementation represents an applied, largely (and unfortunately) atheoretic, multi-disciplinary activity directed toward the provision of useful, policy-relevant information (Wortman, 1983).

It can be instructive for those directing educational interventions to highlight four criteria often used in the evaluation of training programs (Kirkpatrick, 1976):

1) *Reaction criteria*. These criteria concern participant impressions and feelings. One asks questions such as "was the program useful?", or "did the program add to your knowledge?"

2) *Learning criteria*. Rather than simply seeking participant reaction, these criteria concern the learning gained. Questions deal with how much was learned and the kind of knowledge and/or skill learned from a particular program or intervention.

3) *Behavioral criteria*. Criteria with a behavioral emphasis focus on actual changes in participant performance over time, rather than just reaction or learning. The question is one of whether performance has improved as a result of the program or intervention and whether it has maintained over time.

4) *Results criteria*. Criteria of this type are thought to be of the most value. Results criteria compare the benefits of the program with the associated costs. Results criteria can be differentiated from behavioral criteria because the former consider costs, while the behavioral indices do not.

The latter two indices of program effectiveness (i.e., the behavioral and results data) are viewed as *external* to the designated project or innovation.

We are urged by the available evaluation guidelines to have a broad content and temporal perspective as we design projects and reach conclusions relating to the outcome variables we incorporate into our retention-oriented projects. Establishing valid criterion components is of course critical in the evaluation process. As emphasized in the methodological discussion to follow, our ideal is to obtain evidence that the intervention made a difference (i.e., met the stated objectives.) In many instances, project results within the SUCCEED context will have policy implications.

Methodological Issues in Retention-Focused Programs

Systematic evaluation should address the policy question of a program's worth. Was the program effective in the prescribed time period? What is meant by effectiveness entails the proper choice of the criterion (or dependent) measure, what we are trying to improve or increase by implementing a particular intervention. In student retention research, the criterion has traditionally been the retention rate (i.e., how many students stayed enrolled in the institution). Another commonly used criterion in the literature is an index of student achievement, such as degree attainment or years to a degree. The issue of determining the proper criterion (or criteria), while of extreme importance, is beyond the scope of this paper. A major point is that no matter what criterion is chosen as the target of an intervention, it is necessary to be able to ascertain whether the new program was effective in causing a change in the criterion measure. According to Levin and Levin (1993), this evaluation principle requires controlled experimentation and represents the only form of scientific inquiry that will enable the evaluation process to attribute program outcomes directly and unambiguously to retention program characteristics. In other words, it is essential to determine which components of an intervention are effective and should be included in future retention efforts.

The Search for Causation. Establishing cause should be the primary objective in retention research. The goal is to assess program effectiveness. We want to be able to say that the

program (intervention or treatment) was the cause of the change in the retention rate, or the cause of the increase in degree attainment. The core of the theory of causation underlying the design of experiments is to estimate the effects of a treatment contrast (Cook, et al., 1990). Appropriate to our current retention emphasis, Campbell and Stanley (1966) made the point that experimentation is "the only means for settling disputes regarding educational practice, as the only way of verifying educational improvements, and as the only way of establishing a cumulative tradition in which improvements can be introduced without the danger of a faddish discard of old wisdom in favor of inferior novelties."

Several disclaimers are in order. This paper does not claim that all research needs to be experimental in nature to be beneficial. Other types of research efforts, such as descriptions of specific programs and overviews of current trends are of great value in increasing our knowledge of the student retention issue. Also, the present cautions do not attempt to place blame on retention researchers. These issues are of relevance to all participants in the educational arena. All of us must admit that we have fallen short of the ideal on many occasions. Due to practical constraints (time, financial, manpower, etc.), designing the "perfect" evaluation procedure is often an impossibility in the "real" world. However, we believe that paying more attention to methodological issues will result in a better understanding of what can be done realistically to improve student retention and persistence through the baccalaureate. In this way, current and future students should benefit from our concerted efforts.

Lessons From the Retention Literature. As reported in the meta-analysis by Kulik, Kulik, and Shwalb (1983), out of 500 retention program research studies reported in the literature, only 60 (12%) were of acceptable methodological quality. While one might (hopefully) assume that the last eleven years has brought methodological improvements, the retention program literature is still rife with studies of less than ideal research design and the improper use of statistical tests.

At this point it is important to define some relevant terms. The term "experiment" typically carries with it the connotation of laboratory experiments. Obviously, in retention

research we are generally not concerned with this type of experimentation. We are primarily focused on field experimentation. As discussed by Cook, Campbell, and Peracchio (1990), by *field* we mean any setting that participants do not perceive as having been set up for the primary purpose of conducting research. By *experiment*, we mean any experimenter-controlled or naturally occurring event with rapid onset (a treatment or program) whose possible consequences are to be empirically assessed. Experiments are traditionally divided into two types. *Randomized experiments* assign participants to treatments at random, while *quasi experiments* primarily depend on self-selection or administrative decisions to determine who is to be exposed to a treatment. Quasi experiments are typically the most relevant for retention program evaluation efforts, being much easier to implement than randomized experiments in field settings where causal conclusions are needed. However, as further discussed by these authors, a critical point is that quasi experiments can have all the major structural features of experiments, including pretest and posttest observations and comparison groups.

Threats to Validity

One must be aware of various factors than can influence our ability to answer the question of effectiveness in the affirmative. While in practice it may never be possible to rule out all of these threats, effort needs to be directed toward the minimization of these threats, and to make informed decisions of how to design a retention intervention so that one can be as confident as possible that the program, and not some extraneous factor, did indeed influence retention. In this way, others can use this information to benefit their retention efforts.

It can be instructive to us to summarize these threats to validity in four general categories: (1) threats to statistical conclusion validity, (2) threats to construct validity, (3) threats to internal validity, and (4) threats to external validity. While all four types of validity will be defined, the focus of this article will be on the later two --threats to internal and external validity. For more in-depth information on these threats, references such as Cook, et al. (1990) are helpful. Following

an overview of these threats, we will discuss an evaluation of one retention effort undertaken at the Georgia Institute of Technology and will offer practical recommendations that will be useful in improving retention evaluation efforts.

Threats to Statistical Conclusion Validity. Several conditions have to be met to conclude that two variables are causally related and that the direction of causation is from A (a retention intervention) to B (i.e., retention rate, etc.) First, a cause must precede the effect in time. Second, the treatment (A) and effect (B) must covary. Statistical tests are typically used to decide whether the covariation is "real." Again, covariation is a requirement for cause and statistical tests are usually used to make such judgments. Factors which can lead to false conclusions about covariation are called threats to statistical validity.

Threats to Construct Validity. Another concept deals with whether the operations used to ascertain whether A causes B actually represent the theoretical constructs that the researcher claims they do. Threats to construct validity are therefore threats to the correct labeling of the cause and effect operations in abstract terms that come from common language and formal theory.

Threats to Internal Validity. Another necessary condition for causal inference is that there are no plausible alternative explanations of B other than A. In other words, there are no other explanations for the increase in student retention other than the intervention program that was implemented.

For example, it commonly occurs that at-risk students undergo a variety of retention interventions concurrently. The same students might be housed in special buildings, provided with tutoring resources, enrolled in college preparation courses, etc. Even if a positive outcome is realized, there is no way of telling which of the interventions actually resulted in the improved retention. Another possibility is that these students would have attained the same retention rate without special interventions of *any* kind. Threats of this type are called threats to internal validity.

Threats to External Validity. External validity concerns the generalizability of findings across times, settings, and persons. For example, a retention researcher completes research showing that a mentoring program implemented on ten Afro-American female freshman students at a small, midwestern liberal arts college was effective in improving the next year's sophomore retention rate for these students. One would have to be careful in generalizing these findings across different types of students in different types of institutions (e.g., to North Carolina A&T or to a predominantly white university). Examples of this nature are threats to external validity of the findings and recommendations.

An Example of a Retention-Focused Program Evaluation

A host of factors have been studied in relation to student adjustment and effectiveness, including skill deficits, values/attitudes, expectations, and institutional attributes. Many student support initiatives have focused on influencing these variables. The literature provides guidelines and suggestions for evaluating such interventions and a range of evaluation examples. Arbitrarily, we will describe the evaluation of one intervention, a bridge program, as a recent example of an evaluation effort which is retention-oriented.

The Bridge Program Concept

The general orientation model entails a three-phased effort: pre-admissions (usually written communication), pre-enrollment (e.g. summer programs for incoming freshmen) and initial enrollment (i.e., just before classes begin and throughout the first term). Traditionally, summer programs or pre-enrollment interventions involve placement testing, academic advising, registration, and orientation to the campus and student organizations (Perigo & Upcraft, 1989). Single- and multiple-day programs prevail across the nation. The larger the institution, the more likely the presence of these orientation innovations, reports the National Orientation Directors Association.

Efforts to provide a simulation of the college experience in the pre-enrollment phase brings us to the bridge program concept illustrated here. Many universities have tried their particular version of a realistic preview of the college experience. Our example of the preliminary evaluation of a summer intervention to assist minority students emanates from the Georgia Institute of Technology.

CHALLENGE is a summer bridge program started by the Office of Minority Educational Development (OMED) to assist minority student adjustment to college life. This intervention targets all minority students that have been accepted at the institution. The students are invited to participate in a 5-week session during the summer. All who decide to attend are required to pay a fee for books and activities, as well as provide their own transportation to and from Georgia Tech. Throughout the program, students live in residence halls, take classes (including chemistry, calculus, and a "college survival" course), and participate in various extra-curricular group activities.

In the spring of 1992, the senior author and three graduate students were asked by the President's Office to develop a questionnaire that would help evaluate the effectiveness of the CHALLENGE program. The survey development and implementation consisted of six stages: (1) literature review; (2) definition of objectives; (3) selection of variables for measurement; (4) pretests and administration of the questionnaire; (5) interpretation of results; and (6) recommendations and implications.

Stage 1: Literature Review. In this stage, the researchers attempted to identify the key variables for program evaluation. The focus of the review was on "non-cognitive" factors that may affect student retention (i.e. students' perceptions, opinions and attitudes about their social and academic environment.) The reasoning was that variables found to be positively linked to retention might be influenced by the CHALLENGE program. Numerous variables related to student retention were identified.

Stage 2: Definition of Program Objectives. Since the criteria for evaluation depend on stated goals, researchers found it necessary to learn the objectives of the program as they related to minority student retention. At this time, there were no official objectives for the program. Thus, the OMED mission statement was used, with program directors providing further clarification of the stated goals. This goal identification process both ensured that the questionnaire would adequately reflect the objectives of the program and helped reduce the large number of potentially relevant variables to a more manageable set. It was determined that the goals of CHALLENGE were to (1) provide incoming students with the information and tools needed to effectively plan ahead and be "good gamblers" in dividing their efforts, (2) help participants develop self-discipline and (3) give students a realistic preview of freshman-level classes and some instruction in needed skills and strategies.

Stage 3: Selecting Variables for Measurement. Twenty CHALLENGE participants were interviewed to determine why students chose to attend the program. The intentions and expectations identified would be incorporated into the survey instrument to evaluate the program. The instrument development sample of participants reported that meeting people like themselves, "fitting in," and the opportunity to "prepare for the fall," to be reasons for attending the bridge program offered by Georgia Tech. Ultimately, the variables used in the survey instrument were chosen because they reflected the literature on retention, the mission of CHALLENGE, and the expectations of the pilot sample. It was determined that the following factors would be used to assess program effectiveness: 1) perceived academic and social fit, 2) use of coping strategies, 3) level of anxiety, 4) degree of preparedness, and 5) self-efficacy, which is defined as the students subjective assessment of his/her abilities in general and their degree of college readiness. The survey instrument will be available for review and adaptation by our colleagues.

Stage 4: Pretests and Administration of the Questionnaire. After a pretest tryout, the questionnaire was administered to pre-enrollees attending the summer program. The survey included measurement scales of the selected variables and open-ended questions to collect

information regarding students' reasons for participating in CHALLENGE, their impressions of Georgia Tech, as well as the participant's background and an estimate of educational commitment. Forty-five students completed the first administration of the survey during the orientation session. At the conclusion of the program, forty of the original participants provided responses to the same questionnaire. In addition, students were asked to provide recommendations for programmatic changes and to describe positive and negative events that occurred during this abbreviated college experience.

Stage 5: Interpreting the Results. Once all the surveys had been collected from the second administration, the information provided was analyzed with the help of a computer. In order to determine whether a change had occurred, the responses given during the orientation session were compared to those given during the wrap up session. Items measuring the same variable construct were added to form a composite score for that variable. The composite score for that variable for the first questionnaire was compared to the composite score computed from responses for the second administration of the questionnaire. The analysis of variance statistical test was used to determine whether significant changes in scores had occurred for each variable.

The results indicated that the CHALLENGE program affected perceived social fit, coping, and preparedness of the participants. After the program, students reportedly felt an increased sense of fitting in the social environment at Georgia Tech and felt that they were more capable of organizing and managing their time. They also believed that they were more knowledgeable about locations on campus, resources available to them, and ways to spend their free time than when they first entered the program. In addition, a trend toward a reduction of anxiety was seen in participants completing CHALLENGE. However, changes in perceived academic fit and self-efficacy were not evident during the pre-enrollment session on campus.

Stage 6: Recommendations and Implications. Evaluation results generally supported the belief that CHALLENGE served to benefit incoming freshmen minority students. Most participants cited getting a "head start" on the college experience as a major reason for deciding

to attend the summer bridge program. The fact that students felt better prepared for the fall and adopted strategies to become effective students fulfilled the goals set by the program's directors.

Although the available results are encouraging in that the program lived up to the expectation of helping students prepare for and adjust to the college experience, the evidence did not document CHALLENGE as an effective *retention* intervention. Due to the longitudinal nature of process evaluation, Schoob, Bollar and Collins (1992) provided several recommendations for follow-up data collection and analysis. The incorporation of the suggestions into ongoing evaluation of CHALLENGE would better demonstrate a link between participation in the CHALLENGE program and increased retention of minority students and better establish the effectiveness of CHALLENGE by addressing one or more of the threats to validity described above.

1) Correlate the post-test composite scores of variables influenced by CHALLENGE with first quarter grades to see if these scores predict grades.

2) Compare first quarter grades of CHALLENGE participants to a similar sample of minority students not participating in CHALLENGE as well as a group of non-minority students to determine whether attending the program leads to better academic performance.

3) Collect information regarding how realistic CHALLENGE participants' expectations were about Georgia Tech and compare them to the expectations of a non-CHALLENGE minority group and a non-minority group.

4) Use a measure of realism to determine whether realistic expectations are related to outcomes such as academic and social satisfaction with Georgia Tech, academic performance, and retention.

5) Continue to track the CHALLENGE participants in order to see whether participation in CHALLENGE, or specific factor scores representing survey responses, are predictive of retention.

This example of a planned evaluation illustrates the growing awareness that meaningful information, and data, can be obtained for ongoing student interventions. Although various constraints precluded the collection of "evidence" in all four criterion categories mentioned early in this paper (i.e., reaction, learning, behavioral, and results criteria), the student reaction data enabled subsequent program adaptation and the report became a sales tool for funding continuation. The evaluation represents an initial attempt at uncovering the key components of an effective bridge program. In addition, the process of evaluation was instrumental in stimulating decision makers to begin thinking of evaluation in continuous improvement terms and providing input which allows more focused goal setting.

Promotion of Project Evaluation

Encouragement is in order for all of us in higher education in terms of the promise offered by current evaluation concepts and technology. The lesson for SUCCEED participants, and others, is to reach into the diverse literature on student retention (and attrition) and to plan appropriately for a systematic evaluation of our ongoing interventions in engineering improvement. The methodology is available. The link between outcome variables, properly conceived, and the numerous "causes" can be confirmed through our shared efforts.

The multivariate model testing underway is admirable, providing a better understanding of the student persistence phenomenon (e.g., see Cabrera, Nora, & Castaneda, 1993; Gillespie & Noble, 1992; Pascarella & Terenzini, 1983; Stage, 1988). Fortunately, data from college records and student surveys used in sophisticated models of this nature are beginning to provide causative inferences relating to the academic and social dimensions of undergraduate retention. However, caution is issued not to generalize too freely from campus-specific studies.

Our literature reviews are uncovering a host of descriptive studies which address some component of the general student retention "system." Despite a plethora of methodological flaws, the longer view is positive due to the commitment of so many educators and governmental bodies engaged in the continuos improvement of higher education.

Under the aegis of the *talent development approach* (Astin, 1991), renewed attention is directed toward interventions as well as curriculum revision. In particular, the first year of college is getting increased emphasis based on the alarming attrition figures (Upcraft & Gardner, 1990).

As in the aforementioned example of one bridge program, evaluation can be accomplished -and should be. We should not fall prey to the conceptualization of a project and the means for its implementation without adequate recognition of the need to assess outcomes relevant to the stated objectives. Within almost any project context relating to the SUCCEED mission to improve engineering education, we have the evaluation technology among interested and able human resources employed by the eight SUCCEED institutions.

References

Astin, A.W. (1975). Preventing students from dropping out. San Francisco: Jossey-Bass.

Astin, A.W. (1991). Assessment for excellence. New York: American Council on Education, MacMillan Publishing Co.

Astin, A.W. & Panos, R.J. (1969). The educational and vocational development of college students. Washington, D.C.: American Council of Education.

Boyer, E.L. (1987). College: The undergraduate experience in America. Report of the Carnegie Foundation for the Advancement of Teaching. New York: Harper & Row.

Cabrera, A.F., Nora, A., & Castaneda, M.B. (1993). College persistence: Structural equations modeling test of an integrated model of student retention. Journal of Higher Education, 64, 123-139.

Campbell, D.T., & Stanley, J.C. (1966). Experimental and quasi-experimental design for research. Chicago: Rand McNally.

Cook, T.D., Campbell, D.T., & Peracchio, L. (1990). Quasi experimentation. In M.D. Dunnette & Hough, L.M. (Eds.), Handbook of industrial and organizational psychology (pp. 491-576). Palo Alto, CA: Consulting Psychologist Press.

Gillespie, M., & Noble, J. (1992). Factors affecting student persistence: A longitudinal study. ACT Research Report Series, 92-4.

Kirkpatrick, D.L. (1976). Evaluation of training. In R.L. Craig (Ed.), Training and development handbook. New York: McGraw Hill.

Kulik, C.C., Kulik, J.A., & Shwalb, B.J. (1983). College programs for high risk and disadvantaged students: A meta-analysis of findings. Review of Educational Research, 53, 397-414.

Lavin, D.E. (1965). The prediction of academic performance: A theoretical analysis and review of research. New York: Russell Sage Foundation.

Levin, J.R., & Levin, M.E. (1993). Methodological problems in research on academic retention programs for at-risk minority college students. Journal of College Student Development, 34, 118-124.

National Institute of Education (1984). Involvement in learning: Realizing the potential of American higher education. Washington, D.C.: U.S. Department of Education.

Pascarella, E.T., & Terenzini, P.T. (1983). Predicting voluntary freshman year persistence/withdrawal behavior in a residential university: A path analytic validation of Tinto's model. Journal of Educational Psychology, 75, 215-226.

Perigo, D.J., & Upcraft, M.L. (1990). Orientation programs. In M.L. Upcraft & J.N. Gardner (Eds.), The freshman year experience. San Francisco: Jossey-Bass.

Schoob, C., Bollar, S., & Collins, W. (1992). CHALLENGE program: Development, administration, and analysis of a survey for assessing effectiveness. Technical Report, Atlanta, GA: Georgia Institute of Technology.

Schwarz, P.A. (1980). Program devaluation: Can the experiment reform? In E.H. Loveland (Ed.), Measuring the hard-to-measure. San Francisco: Jossey-Bass.

Stage, F.K. (1988). University attrition: LISREL with logical regression for the persistence criterion. Research in Higher Education, 20, 343-357.

Tinto, V. (1975). Drop-out from higher education: A theoretical perspective on recent research. Review of Educational Research, 45, 89-125.

Upcraft, M.L., & Gardner, J.N. (1990). The freshman year experience. San Francisco: Jossey-Bass.

Wortman, P.M. (1983). Evaluation research: A methodological perspective. Annual Review of Psychology, 34, 223-260.